



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 10, 2026 – 08:21 AM UTC

PDB ID : 5Y50 / pdb_00005y50
Title : Crystal structure of eukaryotic MATE transporter AtDTX14
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Deposited on : 2017-08-06
Resolution : 2.60 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

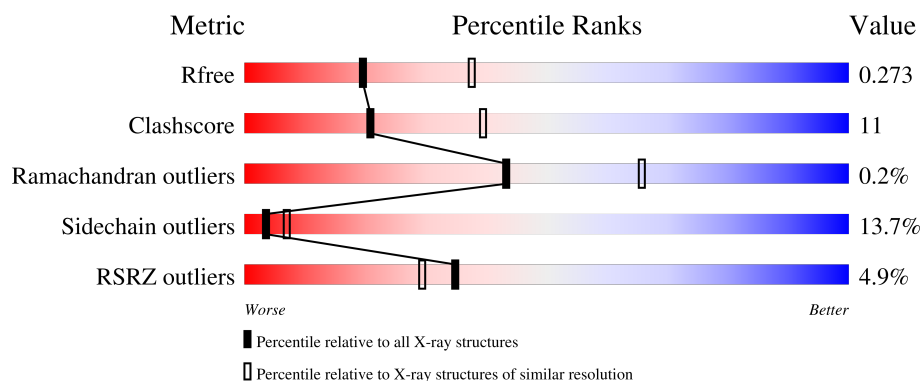
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.60 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	4008 (2.60-2.60)
Clashscore	190562	4347 (2.60-2.60)
Ramachandran outliers	187476	4277 (2.60-2.60)
Sidechain outliers	187428	4277 (2.60-2.60)
RSRZ outliers	180081	4008 (2.60-2.60)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	461	5% 68% 24% 5%

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 3362 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Protein DETOXIFICATION 14.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	448	Total	C	N	O	S	0	0	0
			3362	2202	543	592	25			

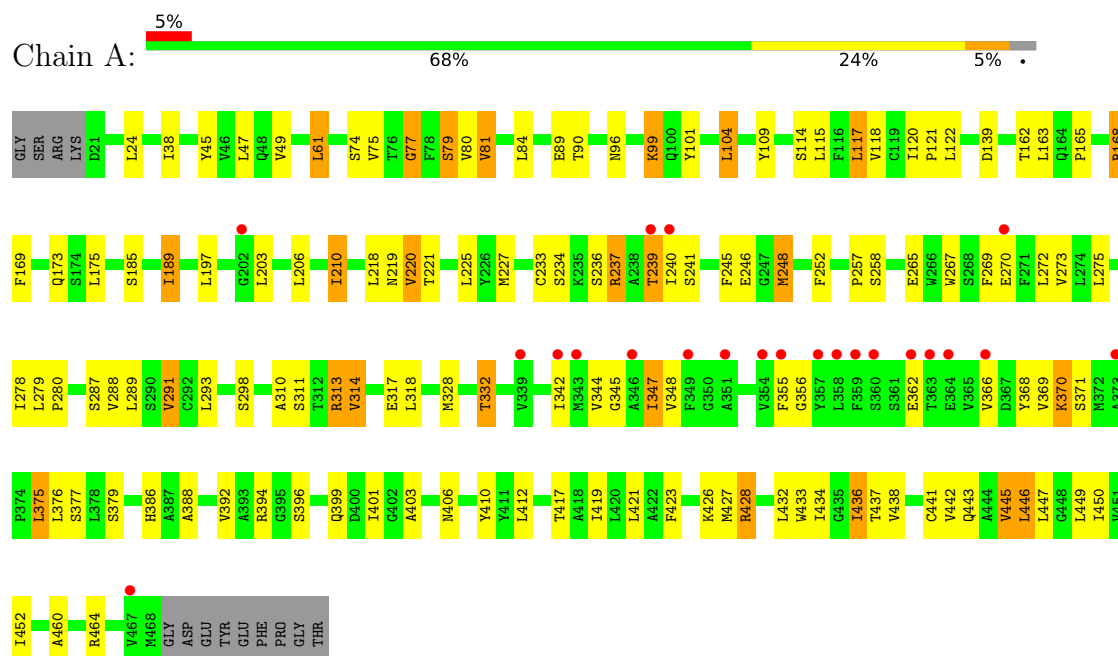
There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	17	GLY	-	expression tag	UNP Q9C994
A	18	SER	-	expression tag	UNP Q9C994
A	19	ARG	-	expression tag	UNP Q9C994
A	36	ALA	PRO	engineered mutation	UNP Q9C994
A	474	PHE	-	expression tag	UNP Q9C994
A	475	PRO	-	expression tag	UNP Q9C994
A	476	GLY	-	expression tag	UNP Q9C994
A	477	THR	-	expression tag	UNP Q9C994

3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: Protein DETOXIFICATION 14



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	52.80Å 86.78Å 116.43Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.34 – 2.60 48.34 – 2.60	Depositor EDS
% Data completeness (in resolution range)	98.4 (48.34-2.60) 98.5 (48.34-2.60)	Depositor EDS
R_{merge}	0.58	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.23 (at 2.61Å)	Xtriage
Refinement program	PHENIX 1.11.1_2575	Depositor
R, R_{free}	0.224 , 0.276 (Not available) , 0.273	Depositor DCC
R_{free} test set	842 reflections (4.93%)	wwPDB-VP
Wilson B-factor (Å ²)	45.2	Xtriage
Anisotropy	0.525	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 53.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	3362	wwPDB-VP
Average B, all atoms (Å ²)	52.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.78% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	0.37	0/3432	0.56	1/4657 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	428	ARG	CB-CA-C	-6.78	108.77	116.63

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3362	0	3470	76	0
All	All	3362	0	3470	76	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 11.

All (76) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:75:VAL:HG13	1:A:267:TRP:HD1	1.39	0.86
1:A:406:ASN:OD1	1:A:443:GLN:NE2	2.14	0.81

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:356:GLY:HA3	1:A:370:LYS:HE2	1.72	0.71
1:A:89:GLU:OE1	1:A:394:ARG:NH1	2.28	0.67
1:A:75:VAL:HG13	1:A:267:TRP:CD1	2.28	0.63
1:A:328:MET:O	1:A:332:THR:HG23	2.02	0.60
1:A:45:TYR:OH	1:A:298:SER:HB3	2.03	0.59
1:A:257:PRO:HB2	1:A:399:GLN:HB3	1.84	0.59
1:A:206:LEU:O	1:A:210:ILE:HG23	2.03	0.58
1:A:233:CYS:O	1:A:237:ARG:HB3	2.04	0.58
1:A:344:VAL:HA	1:A:347:ILE:HG22	1.85	0.58
1:A:258:SER:OG	1:A:399:GLN:HG2	2.05	0.57
1:A:101:TYR:O	1:A:236:SER:HA	2.06	0.56
1:A:75:VAL:HG21	1:A:270:GLU:HB2	1.88	0.55
1:A:245:PHE:HA	1:A:248:MET:HG3	1.87	0.55
1:A:368:TYR:O	1:A:371:SER:OG	2.17	0.54
1:A:278:ILE:HG13	1:A:423:PHE:HZ	1.72	0.54
1:A:366:VAL:O	1:A:370:LYS:HD2	2.08	0.54
1:A:433:TRP:O	1:A:437:THR:HG23	2.07	0.54
1:A:280:PRO:HB2	1:A:428:ARG:NH1	2.24	0.53
1:A:375:LEU:HD11	1:A:434:ILE:HG13	1.92	0.52
1:A:376:LEU:HB2	1:A:433:TRP:HH2	1.75	0.52
1:A:173:GLN:HB2	1:A:175:LEU:HG	1.92	0.52
1:A:280:PRO:HB2	1:A:428:ARG:HH12	1.75	0.51
1:A:433:TRP:O	1:A:436:ILE:HG22	2.11	0.50
1:A:74:SER:O	1:A:79:SER:HB2	2.12	0.50
1:A:442:VAL:HG12	1:A:446:LEU:HD22	1.94	0.49
1:A:120:ILE:HB	1:A:121:PRO:HD3	1.94	0.49
1:A:197:LEU:O	1:A:203:LEU:HB2	2.12	0.49
1:A:278:ILE:HG13	1:A:423:PHE:CZ	2.48	0.49
1:A:239:THR:HG23	1:A:241:SER:HB3	1.94	0.49
1:A:288:VAL:HG11	1:A:368:TYR:CE2	2.47	0.48
1:A:287:SER:O	1:A:291:VAL:HG12	2.14	0.48
1:A:162:THR:O	1:A:165:PRO:HD2	2.14	0.48
1:A:169:PHE:CE2	1:A:227:MET:HG3	2.48	0.48
1:A:293:LEU:O	1:A:293:LEU:HD12	2.15	0.46
1:A:318:LEU:HD12	1:A:396:SER:HA	1.96	0.46
1:A:114:SER:HB3	1:A:252:PHE:CE2	2.50	0.46
1:A:163:LEU:HB2	1:A:220:VAL:HG23	1.99	0.45
1:A:310:ALA:O	1:A:314:VAL:HG13	2.16	0.45
1:A:434:ILE:O	1:A:438:VAL:HG23	2.16	0.45
1:A:77:GLY:HA2	1:A:122:LEU:HD13	1.99	0.45
1:A:362:GLU:O	1:A:366:VAL:HG23	2.17	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:99:LYS:HD3	1:A:101:TYR:OH	2.18	0.44
1:A:356:GLY:CA	1:A:370:LYS:HE2	2.44	0.44
1:A:345:GLY:O	1:A:377:SER:OG	2.31	0.44
1:A:89:GLU:OE2	1:A:168:ARG:NH2	2.51	0.44
1:A:441:CYS:O	1:A:445:VAL:HG13	2.17	0.44
1:A:185:SER:OG	1:A:189:ILE:HD11	2.18	0.44
1:A:289:LEU:HA	1:A:289:LEU:HD12	1.78	0.44
1:A:313:ARG:NH2	1:A:317:GLU:OE1	2.50	0.44
1:A:460:ALA:O	1:A:464:ARG:HG3	2.18	0.44
1:A:117:LEU:HD12	1:A:117:LEU:HA	1.80	0.44
1:A:288:VAL:HG23	1:A:369:VAL:HG23	1.99	0.43
1:A:421:LEU:HD22	1:A:427:MET:SD	2.58	0.43
1:A:96:ASN:HB2	1:A:104:LEU:HD11	2.01	0.43
1:A:221:THR:O	1:A:225:LEU:HG	2.19	0.43
1:A:344:VAL:HA	1:A:347:ILE:CG2	2.47	0.43
1:A:81:VAL:HG23	1:A:115:LEU:HD22	2.00	0.43
1:A:388:ALA:O	1:A:392:VAL:HG23	2.19	0.42
1:A:265:GLU:HB2	1:A:410:TYR:CZ	2.54	0.42
1:A:61:LEU:O	1:A:61:LEU:HD22	2.19	0.42
1:A:386:HIS:CG	1:A:443:GLN:HG2	2.55	0.42
1:A:270:GLU:O	1:A:273:VAL:HG22	2.20	0.42
1:A:318:LEU:CD1	1:A:396:SER:HA	2.50	0.41
1:A:348:VAL:HG12	1:A:355:PHE:CE2	2.56	0.41
1:A:248:MET:HE3	1:A:248:MET:HB3	1.75	0.41
1:A:447:LEU:HD23	1:A:447:LEU:HA	1.72	0.41
1:A:109:TYR:CE2	1:A:240:ILE:HG12	2.56	0.41
1:A:417:THR:HG21	1:A:438:VAL:HG21	2.03	0.41
1:A:288:VAL:O	1:A:291:VAL:HG13	2.21	0.41
1:A:272:LEU:HD22	1:A:432:LEU:HD22	2.03	0.40
1:A:452:ILE:HD13	1:A:452:ILE:HA	1.86	0.40
1:A:269:PHE:O	1:A:273:VAL:HG13	2.21	0.40
1:A:366:VAL:HG12	1:A:370:LYS:CD	2.52	0.40
1:A:403:ALA:O	1:A:406:ASN:HB3	2.22	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	446/461 (97%)	437 (98%)	8 (2%)	1 (0%)	43	66

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	77	GLY

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	342/372 (92%)	295 (86%)	47 (14%)	3	7

All (47) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	24	LEU
1	A	38	ILE
1	A	47	LEU
1	A	49	VAL
1	A	61	LEU
1	A	79	SER
1	A	80	VAL
1	A	81	VAL
1	A	84	LEU
1	A	90	THR

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Mol	Chain	Res	Type
1	A	99	LYS
1	A	104	LEU
1	A	117	LEU
1	A	118	VAL
1	A	139	ASP
1	A	168	ARG
1	A	189	ILE
1	A	210	ILE
1	A	218	LEU
1	A	219	ASN
1	A	220	VAL
1	A	234	SER
1	A	237	ARG
1	A	239	THR
1	A	246	GLU
1	A	248	MET
1	A	275	LEU
1	A	279	LEU
1	A	291	VAL
1	A	311	SER
1	A	313	ARG
1	A	314	VAL
1	A	332	THR
1	A	342	ILE
1	A	347	ILE
1	A	370	LYS
1	A	375	LEU
1	A	379	SER
1	A	401	ILE
1	A	412	LEU
1	A	419	ILE
1	A	426	LYS
1	A	436	ILE
1	A	445	VAL
1	A	446	LEU
1	A	449	LEU
1	A	450	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	219	ASN

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Mol	Chain	Res	Type
1	A	459	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	448/461 (97%)	0.49	22 (4%) 35 29	29, 50, 76, 99	0

All (22) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	349	PHE	3.6
1	A	354	VAL	3.6
1	A	342	ILE	3.3
1	A	343	MET	3.2
1	A	270	GLU	3.2
1	A	357	TYR	3.1
1	A	359	PHE	3.0
1	A	240	ILE	2.8
1	A	339	VAL	2.7
1	A	202	GLY	2.7
1	A	358	LEU	2.6
1	A	363	THR	2.6
1	A	239	THR	2.5
1	A	362	GLU	2.5
1	A	360	SER	2.3
1	A	351	ALA	2.3
1	A	346	ALA	2.3
1	A	366	VAL	2.3
1	A	467	VAL	2.2
1	A	364	GLU	2.1
1	A	373	ALA	2.1
1	A	355	PHE	2.1

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.